Modern Physics Letters A 2015 vol.30 N16

Unbounded energies of debris from head-on particle collisions near black holes

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Abstract

© 2015 World Scientific Publishing Company. If two particles move toward a black hole and collide near the horizon, the energy Ec.m. in the centre of mass can grow unbounded. This is a so-called Bañados-Silk-West (BSW) effect. One of the problems creating obstacles to the possibility of its observation consists in that individual energy E of a fragment at infinity remains finite because of redshift. We show that in the case of head-on collision, debris may have unbounded energy E. An essential ingredient of this scenario is a particle moving away from a black hole in the near-horizon region. It can appear due to precedent collision that implies multiple scattering.

http://dx.doi.org/10.1142/S0217732315500765

Keywords

acceleration of particles, Black hole horizon, centre of mass